

# VACCINATION

What it has done

What it is

What it will do

Written by

CHAS. A. HODGETTS, M.D., L.R.C.P., Lond.

Secretary of the Provincial Board of Health and

Chief Health Officer of Ontario

PUBLISHED BY ORDER



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*Queen's University at Kingston*



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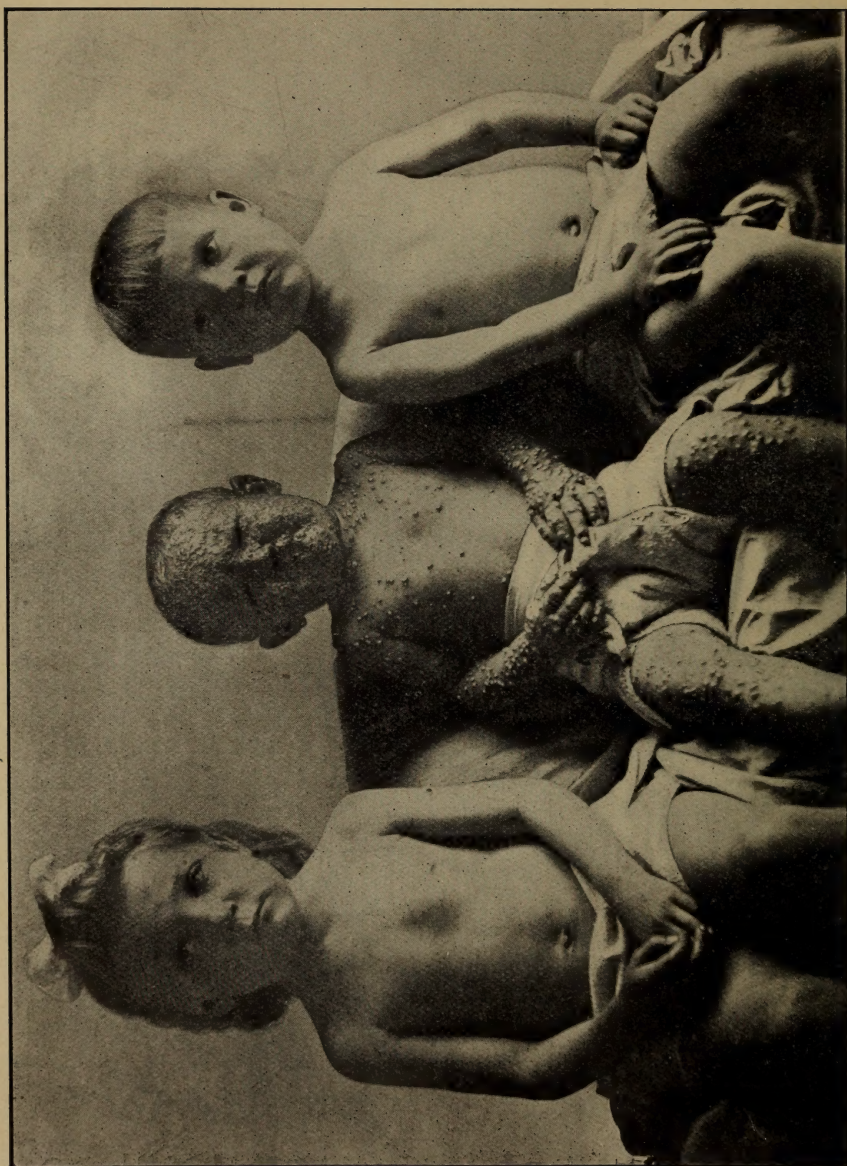
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THREE MEMBERS OF A FAMILY BROUGHT TO THE ISOLATION HOSPITAL WITH THEIR MOTHER WHO WAS SUFFERING FROM SMALLPOX.

The child in the centre was *unvaccinated*, the other two had been vaccinated a year before because of the school vaccination requirements, the two vaccinated remained in the smallpox wards several weeks and never contracted the disease.

From "Welch and Schamberg on Acute Contagious Diseases."



## PREFACE.

### *To the Public of Ontario :*

The facts as set forth in this pamphlet are intended not so much for medical practitioners as for the general public, the majority of whom are not seized of the truths as regards vaccination and the wonderful results which followed the introduction of the practice by Jenner in 1796, whereby the then scourge of Europe was successfully met, and whereby it may be entirely suppressed if the practice of vaccination and re-vaccination is but universally adopted.

The data herein collated is authentic and the facts and deductions accepted as sound by those having practical experience and a thorough scientific knowledge of both vaccination and smallpox. The reader is asked to weigh them well and set them against the distorted figures, the half truths and mis-statements of the small minority who would have you believe and follow a coterie of (un)scientific observers and amateurs, whose theories are as sound as their knowledge of vaccination and smallpox is the result of personal observation and practical experience.

It is desired to impress upon the public that in everything concerning public health the rule is always— "*Salus populi suprema lex esto.*" (Let the people's safety be the supreme law.)

C. A. H.

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# A Descriptive Article on Vaccination.

BY CHAS. A. HODGETTS, M.D., L.R.C.P., LOND.

*Sec. Provincial Board of Health and Chief Health Officer of Ontario.*

The casual remark made by a farmer's daughter, in the hearing of a young medical student, upon being informed of an outbreak of smallpox in the district where she resided, "I cannot take that disease for I have had cowpox," was sufficient to impress the mind of Edward Jenner and lead him to devote years of patient study and careful experiment, which culminated in his being able to confidently state to the world that vaccination gave immunity from that loathsome, malignant, disfiguring and deadly disease, smallpox, of which, up to that time no means had been found to prevent its spread. A statement which more than a century of experience in the civilized countries of every continent has been established deeper and deeper with each passing decade; indeed, it may be said, the chief, if not the only opposition, of the practice has, strange to say, come from those who may be considered fellow-countrymen of this world's benefactor; a modern instance of a prophet not being without honor save in his own country and among his own kinsfolk.

As to the beneficial results of this discovery, which was freely given by Jenner to the world, the following outline of the effects of vaccination upon the ravages of smallpox will plainly show.

The information is collated from the writings and experiences of practical workers in this field of preventive medicine, those who have had special opportunities to personally treat large numbers of cases of smallpox and perform general vaccination, and carry out the work incident to outbreaks of the disease. None of them are scientific theorists, faddists, or juggling statisticians. With them it is a case of facts founded on experience, which together are stronger than fiction based on false theories.

## *Early History of Smallpox.*

Without referring to the early writings upon the subject of smallpox, from which, however, it is quite evident the disease prevailed in many parts of Asia and Africa long before the beginning of the Christian era, accompanied with miseries of the worst kind, we will pass on to the year 581 A.D., when the disease was epidemic in southern France and northern Italy, as described by Gregory, of Tours, whence it spread rapidly in all directions, invading Iceland in 1341 A.D. During the wars of the Crusades, epidemics of the disease in a malignant form were numerous.

## *Smallpox in the Eighteenth Century.*

It was, perhaps, most widely distributed and malignant in form in Europe during the eighteenth century, no country was free from the pestilence; at least a tenth of all the deaths occurring at that time were



due to it. In France alone 30,000 died annually, and nearly a like number in the then Kingdom of Prussia. It was the common experience then as now (amongst the unvaccinated) that the disease was no respecter of persons—the high and the low, the rich and the poor, the suckling child and decrepit age, all the groups were called upon to offer victims to this moloch of disease. In all classes of society were found those seared, scarred or maimed for life as the result of it.

It is estimated that during this century only five out of every hundred persons went through life without being attacked by it. The estimated number of deaths in Europe from smallpox (Juncker) were 400,000, while the "Bills of Mortality" for London alone, from 1761 to 1800, show the deaths in that city from smallpox alone to have averaged each year 19,425, and according to Lettsom, most children in that city had the disease before the seventh year of life.

Many lengthy tables\* could be given showing the deaths which happened yearly in the countries and cities of Europe during the latter portion of the 18th and early years of the 19th century before vaccination was introduced. As they can be found in any standard work upon the subject they will not be given here, suffice to say that their correctness is unquestioned.

The following data, however, is most interesting, as indicating the marked contrast of the ravages of smallpox in pre-vaccination periods when compared with those years after its introduction in various cities and countries. In studying these figures it must be remembered that vaccination was purely a voluntary matter in the years immediately following its introduction, and even when made compulsory some time must necessarily elapse before the majority had been vaccinated, hence must follow a gradual decrease in the death rates from smallpox.

#### *Smallpox in Sweden.*

In Sweden vaccination was made compulsory in 1816, but, as a result of voluntary vaccination before that date, it is found the average yearly death rate per million of the population for the decade 1802-1811 was 623, while in the next decade, 1812-1821, it fell to 133, as against a yearly average of 2,050, for the twenty-eight years immediately preceding vaccination.

Perhaps the most striking figures presented as showing the beneficial effects of vaccination are those of Sweden, as the figures are obtainable from three distinct periods, viz., pre-vaccination, permissive vaccination, and compulsory vaccination. The mortality in each case is per million lives:—

- |  |   |
|--|---|
| (a) Pre-vaccination .....              | 1774-1810, average 2,045, for 28 years. |
| (b) Permissive vaccination. 1802-1816, | " 480, " 15 "                           |
| (c) Compulsory vaccination 1817-1893,  | " 155, " 77 "                           |

#### *University of Prague Report.*

Again, in official figures of the University of Prague for seven years preceding vaccination, viz., 1796-1802, out of an average population of 3,039,722, it is found that one-twelfth of all the deaths were due to

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\*Paper by Mr. John Senior, 1857.



smallpox, or 7,663 out of 94,955 deaths from all causes; while for the twenty-four years from 1832 to 1855 (inclusive), out of an average population of 4,248,155, only 287 persons, averaged annually died from smallpox out of an annual average of 131,412, or 1 to 457.

*In Copenhagen and Berlin.*

Similarly in Copenhagen, for the fifty years, 1751 to 1800, the smallpox death rate was 3,422, while for the first forty years of vaccination it averaged only 286. In Berlin, during twenty-four years preceding vaccination, the death rate was 3,422, and for the forty years succeeding vaccination 176, from smallpox.

*Vaccination had Reduced Smallpox by Middle of Nineteenth Century.*

So general had vaccination become by the middle of the nineteenth century, the fatality had been reduced in Copenhagen to one-eleventh of the pre-vaccination rate; in Sweden to nearly one-thirteenth; in Berlin, one-twentieth; while in London the smallpox deaths by decades both before and after the introduction of vaccination were as follows:—

<i>Before Vaccination.</i>		<i>After Vaccination.</i>	
Decade.	Deaths from Smallpox.	Decade.	Deaths from Smallpox.
1761-1770.....	20,434	1801-1810.....	12,534
1771-1780.....	20,923	1811-1820.....	7,858
1781-1790.....	17,867	1821-1830.....	6,900
1791-1800.....	18,477		

Many similar tables could be given in proof of the fact that with the introduction of vaccination came a decrease in the number of deaths, but to extend the truth is quite unnecessary.

*Vaccination has Changed Age Incidence.*

It may be both of interest and importance to the question to illustrate the fact, that vaccination has changed the age incidence of smallpox. The figures are those of Warrington, in which epidemics of smallpox occurred in 1773, when the population was 8,000, and 211 deaths happened; again in 1893, when the population was 54,084, of whom 53,645 were vaccinated.

The ages are as follows:—

	1773.		1893.
	All unvaccinated.	Vaccinated.	Unvaccinated.
Under one year.....	49	0	8*
1 to 2 years.....	84	0	1
2 to 3 years.....	33	0	0
3 to 4 years.....	18	0	1
4 to 5 years.....	15	0	1
5 to 6 years.....	4	0	0
6 to 7 years.....	2	0	0
7 to 8 years.....	2	0	0
8 to 9 years.....	4	1	1
9 to 15 years.....	0	1	1
15 to 20 years.....	0	1	2
20 to 30 years.....	0	10	4
30 to 60 years.....	0	24	5
Over 60 years.....	0	1	0
	211	28	24

The lesson taught here is that in the 1773 outbreak all the deaths were under ten years of age, and nine-tenths under five years of age; while in 1893 not a death occurred under eight years of age, and it is a fact that not a vaccinated child under eight years of age contracted smallpox.

*Report of British Royal Vaccination Commission Shows a Marked Change in Age Incidence.*

The following table from the Report of British Royal Vaccination Commission :—

*Smallpox in Children of the Age of 1 to 10 years.*

Vaccinated.		Unvaccinated.	
Attacks.....	570	1,235	
Deaths.....	16	375	
Fatality, per cent.....	2.8	30.3	

shows the great difference between the death rate of children under ten years of age in the two groups.

Again, quoting from the report of the same Commission, the statistics of six recent epidemics in that country, viz. :—

Dewsbury.....	1891-2	Warrington.....	1892-3
Leicester.....	1892-3	London.....	1892-3
Gloucester.....	1892-3	Sheffield.....	

Of 11,065 cases reported there were 1,283 deaths, or 11.5 per cent., as follows :—

Vaccinated.		Unvaccinated.	
Cases.....	8,744	2,321	
Deaths.....	461	822	
Per cent.....	5	35.4	

The deaths amongst the unvaccinated being seven times greater than in the vaccination groups; while of this same group, of the children under ten years of age, the returns are as follows :—

*Children Under 10 Years of Age.*

Vaccinated.		Unvaccinated.	
Cases.....	589	1,449	
Deaths.....	16	523	
Per cent.....	2.7	36.	

In this group the ratio standing as one to eighteen in favor of vaccinated children.

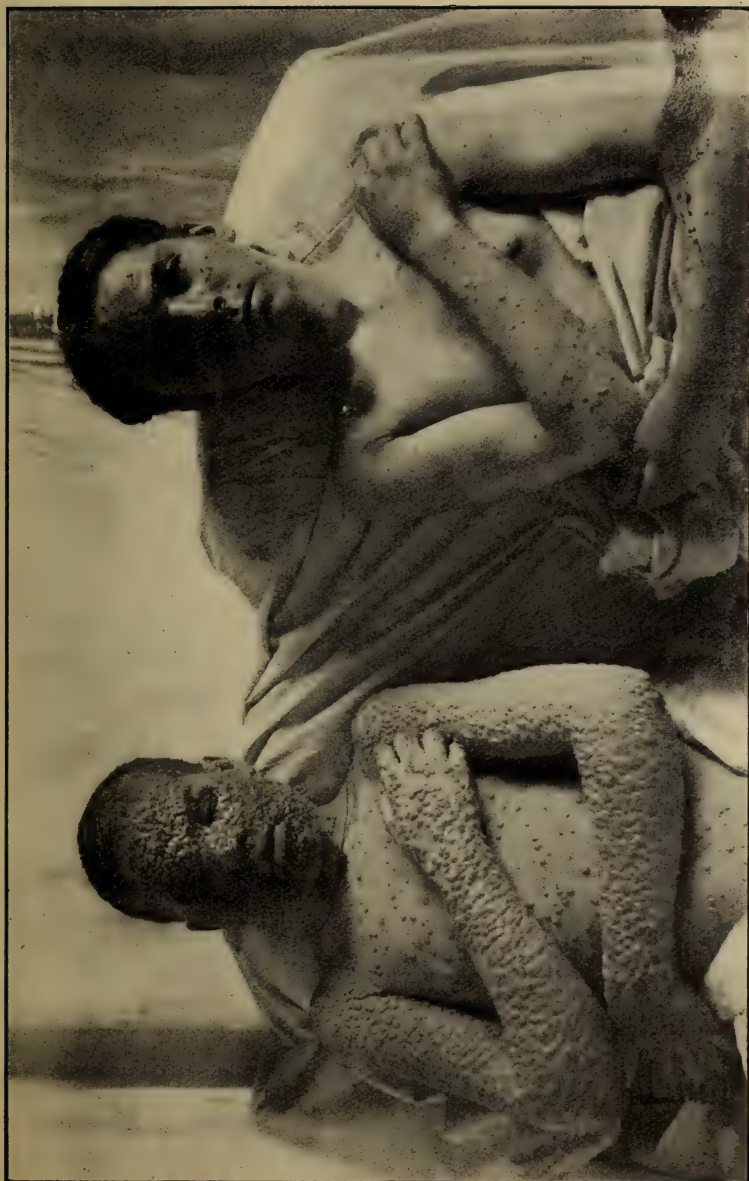
*Facts of Leicester Experience, 1892=3.*

In this connection a short statement may be made in reference to the much vaunted Leicester experience of 1892-3. The facts are briefly as follows :—

“Two vaccinated children were attacked with smallpox, neither of whom died. Of unvaccinated children of the same age period 107 were attacked, of whom 15, or 14 per cent., died. Over ten years of age, 197 vaccinated persons were attacked, of whom two died, or one per cent. Of unvaccinated persons over ten years, 51 were attacked, of whom four, or 7.8 per cent. succumbed.”

\*Under 1 month.





TWO SISTERS SUFFERING FROM SMALL-POX.

The one on the right, aged 14, was successfully vaccinated in infancy ; she contracted a mild modified small-pox and recovered without any scarring. The other, *unvaccinated*, developed a severe small-pox, finally recovering, although considerably pitted.

From "Welch and Schamberg on Acute Contagious Diseases."

Where in these figures is there anything to disprove that vaccination is a life saver?

*Influence of Vaccination on Attack Rates in Children.*

Passing from the facts and figures proving the death rate of smallpox to be lower in the vaccinated than the unvaccinated, it will be interesting to consider the influence of vaccination on the attack rate, and for this purpose the returns of five recent outbreaks are given:—

Attack rate under 10 years of age.		Attack rate over 10 years of age.	
Vaccinated.	Unvaccinated.	Vaccinated.	Unvaccinated.
Sheffield.....	7.9	67.6	28.3
Warrington....	4.4	54.5	29.9
Dewsbury.....	10.2	50.8	27.7
Leicester.....	2.5	35.3	22.2
Gloucester.....	8.8	46.3	32.2
			53.6
			57.6
			53.4
			47.6
			50.

The attention of the reader is directed in this table to the lessened liability to attack of smallpox among children under ten years of age, that is the ages nearer to the date of the first or primary vaccination, than in those of older age, and if further proof of this fact is needed, the following, extracted from the British Royal Commission Report is given, the epidemic dealt with being that of Sheffield.

*Sheffield Attack Rate.*

Vaccinated population.....	268,397	Unvaccinated population ....	5,715
Attacked by Smallpox.....	4,151	Attacked by Smallpox.....	552
Per cent.....	1.55	Per cent.....	9.7
Vaccinated children under 10 ..	68,236	Unvaccinated children under	
Attacked by Smallpox.....	353	10.....	2,259
Per cent.....	0.5	Attacked by Smallpox.....	228
Vaccinated 10 years and up....	196,905	Per cent.....	10.1
Attacked by Smallpox.....	3,774	Unvaccinated persons 10 years	
Per cent.....	1.9	and up. ....	3,429
		Attacked by Smallpox.....	322
		Per cent.....	9.4

*Lesson Taught Regarding Beneficial Effects of Vaccination.*

Having so far considered simply the effects of what is known as primary vaccination, *i.e.*, the first successful vaccination of an individual by bovine vaccine, some consideration will be given to revaccination statistics, but before doing so it may profit somewhat if the reader is reminded of the lesson learned, *viz.*, **Successful (primary) Vaccination lessens both the Incidence and the Mortality of Smallpox.** The following figures will prove that *those successfully revaccinated are less frequently attacked with smallpox than those only once vaccinated.*

*Figures of Results of Revaccination.*

In Sheffield (1887), of 64,431 revaccinated persons, 27 were attacked, with one death, the attack rate being 0.04 per cent.

In Leicester (1892-3), in a group of 133 houses, with 842 inmates, 141 persons were attacked and of the 84 revaccinated inmates only one developed smallpox. Again, in 60 houses, with 392 inmates, 179 were attacked, and of the 31 revaccinated, 5 developed the disease.



In Warrington (1892-3), of 64 revaccinated inmates of infected houses eight, or 12.5 per cent., were attacked, while in the same houses were 41 who had primarily had smallpox, of whom five, or 12.1 per cent., had a second attack of smallpox, and it is to be noted no deaths occurred among either of these two groups.

### *Compulsory Revaccination in Germany.*

The introduction of compulsory vaccination into Germany was largely brought about by the great difference vaccination and revaccination produced in the German army in respect to smallpox, as compared with the results in the army of France, which was but poorly vaccinated. A comparison of the mortality from smallpox since 1875 in the five large German cities compared with four large cities outside of that country is most instructive, as showing the difference in death rate between vaccinated and unvaccinated cities.

### *Revaccinated German Cities Lower Death Rate Than Those of Other Unvaccinated Cities.*

During the first decade after the introduction of revaccination (1875-1884), there died from smallpox on a yearly average per 100,000 inhabitants :—

Berlin, .....	only 1.16 persons.
Hamburg .....	" 0.74 "
Breslau .....	" 1.11 "
Munich .....	" 1.45 "
Dresden .....	" 1.03 "

While in the same time the rates were :—

Paris .....	26.24 persons
St. Petersburg .....	35.82 "
Vienna .....	64.90 "
Prague .....	147.90 "

The figures show the rate of mortality from smallpox in German cities is extremely small as compared with Paris, St. Petersburg, Vienna and Prague.

From a recent communication, 1896, of the German Imperial Board of Health to the Reichstag, we learn that for the years 1886-1891 the annual death rate from smallpox throughout the Empire averaged 126, and that only 2.3 persons per million inhabitants from 1889-1893 died of the disease; while calculated in the same way the French cities show a death rate per year of 14.7 persons; Belguim, 252.9; Austria, 313.4; Russia (1891-1893) of 836.4. In other words if the mortality of Germany had been as great as in these countries, there would have been (instead of only 126) no less than 7,321 deaths.

### *Comparison with Vaccinated Army.*

While vaccination was enforced in the German Army, it must be remembered the law of compulsory vaccination throughout the empire was not passed until April 8th, 1874, hence a comparison is possible as between the nation and the army. During 1871 there were 59,839 deaths from smallpox in the whole country, as compared with 459 deaths in the entire army domiciled both in Germany and France. The figures, however, are still more convincing in favor of vaccination when a comparison is made between the army and the City of Berlin, whose population

of 826,341 was much smaller than that of the army, the deaths from smallpox in the city being 5,508, or twelve times as many more than in the vaccinated army, although the latter was numerically larger.

Again, Germany affords a striking proof of the benefits which followed the compulsory enactment of 1875; previous to this date viz., in 1871-2 the death rate per 100,000 was 243.2 and 262.67 respectively; while in the years from 1875 to 1886, the average yearly mortality per 100,000 was 1.91 the maximum being 3.6 in the year 1877.

Again in 1897 there were but five deaths from smallpox, in a population of fifty-four million people.

Returning again to army statistics, a comparison may be made, between the vaccinated army of Germany, and the imperfectly vaccinated armies of Austria and France, and in considering these figures it must be remembered that the army of Germany was the largest numerically.

#### *Number of Cases of Smallpox.*

German army, 1875-1887 .....	148 men.*
French army, 1875-1881 .....	5,605 men.
Austrian army, 1875-1886 .....	10,238 men.

#### *Table Showing Countries With Compulsory Vaccination Laws are First Free from Smallpox.*

But what are the facts and figures when we compare the returns of smallpox in the different European countries. The figures on the table bespeak the facts, that the countries having the strongest vaccination enactments suffer the least from smallpox, and they also enunciate the truth that, without vaccination, smallpox is and must be regarded as a scourge and a great destroyer of human life.

In sixteen countries 346,520 persons were sacrificed to smallpox, and of this total 275,502 occurred in Russia. The most of these deaths might have been prevented by vaccination.

#### *Smallpox in Sixteen European Countries 1893-97.*

	Population.	Averages yearly mortality per million.	Deaths from Smallpox.
Germany .....	52,042,282	1.1	287
Denmark .....	793,356	0.5	2
Sweden .....	4,894,790	2.1	41
Norway .....	2,045,900	0.6	5
England and Wales .....	30,389,524	20.2	3,066
Scotland .....	4,155,886	12.3	256
Ireland .....	4,580,555	9.9	226
Switzerland .....	3,032,901	5.1	78
Netherlands .....	4,797,249	38.7	929
Belgium .....	6,419,498	99.9	3,208
French States .....	8,253,079	90.2	3,721
Russian Empire (including Asiatic Russia) .....	118,950,400	436.2	275,502
Austria .....	23,000,000	99.1	11,799
Italy .....	31,007,422	72.7	11,278
Spain .....	10,596,649	563.4	23,881
Hungary .....	18,234,916	134.3	12,241

\* With only one death and this an unsuccessfully revaccinated reservist.



*Beneficial Results of Vaccination in Schools in England.*

One of the latest examples which illustrates the beneficial effects of vaccination occurred in a school at Ossett near Wakefield, England, in the fall of 1904. On October 27th, the master observed a girl aged 11 in class room A, class standard IV, with a suspicious rash on the face and hands. The M. O. H. was immediately notified and he diagnosed smallpox and removed the girl to the hospital. There evidently had been considerable exposure and the results of the sowing of the seed upon vaccinated and unvaccinated ground is shown as follows:—

Room or Class.	UNVACCINATED SCHOLARS.			VACCINATED SCHOLARS.			TOTAL SCHOLARS.		
	Taking Small-pox.		Escap- ing.	Taking Small-pox.		Escap- ing.	Taking Small-pox.		Escap- ing.
Room A (Standard IV) }	8		0	0		8	19		19
(Remainder of Room A..... }	12		2	5		17	23		25
Room B.....	13		30	0		13	31		61
Room C.....	4		8	0		4	14		22
	37		49	5		87	42		127
Total.....		77			92			169	

The interesting features of this accidental experiment are:—

(1) Every unvaccinated scholar in Standard IV developed Smallpox, while every vaccinated one escaped.

(2) Of the 42 pupils in the remaining classes in Room A, twelve out of the fourteen unvaccinated went down with the disease.

(3) Of the five vaccinated who were attacked all were over 11 years of age, and none of them had been revaccinated.

(4) None of the revaccinated were affected.

(5) In Room B, 31 were vaccinated and 43 unvaccinated, all the former escaped while, 13 of the unvaccinated took the disease.

(6) Of the 26 scholars aged 6 to 9 years in Room C, 14 were vaccinated and 12 unvaccinated, while the former escaped, yet 4 of the unvaccinated took smallpox. Several similar instances have occurred in the writer's experience in rural schools in Ontario.

*Protection of Doctors and Attendants of Smallpox Hospitals.*

The effects of vaccination and revaccination in protecting medical men and nurses in charge of Smallpox Hospitals has so frequently been misrepresented that a few words upon the subject may be acceptable to the reader. If these vaccinated persons who live amongst and are brought intimately into contact with smallpox patients, escape the constant and repeated exposures to the infection, it may very justly be claimed that the cause of vaccination has been greatly strengthened,

*London, Birmingham, Philadelphia.*

The following are among many similar experiences. During 1876-79 there were admitted 11,412 smallpox cases to the London Hospitals, the

total number of employees was 1,000, and of these only 6 developed smallpox, and these had not been revaccinated; while the remaining 994 had been so immunized. Again, in reference to the London Smallpox Hospitals, Dr. Maison stated in 1871 "that during the preceding 35 years no nurse or servant at the hospital had been attacked with smallpox." Similarly, Dr. Hill, Birmingham, Eng., reports during the epidemic of 1893 over 100 persons employees in the City Smallpox Hospital, all of whom were revaccinated, not one contracted the disease, and at the Municipal Hospital, Philadelphia, Drs. Welch and Schamberg, state during a period



SMALLPOX IN AN UNVACCINATED CHILD WHICH DIED—OTHER CHILD PROTECTED BY VACCINATION.

From "Welch and Schamberg on Acute Contagious Diseases."

of 30 years in which time 9,000 cases of smallpox were treated, "we have not had a physician, nurse or attendant who had been successfully vaccinated or revaccinated prior to going on duty, contract the disease." And coming to still more recent years, in the same hospital 1901-1904, the same authorities state that of over 3,500 cases received not one had ever been recently successfully vaccinated. Again, in the same Hospital during a period of five years during which over 700 medical students visited the hospital to study the disease, only one student contracted



smallpox, and he was the only one who had never been successfully vaccinated, the remaining 699 had been protected by vaccination.

*The Effect of Sanitation Upon the Spread of Smallpox.*

It is frequently stated by those who do not study the subject that the decrease in smallpox has been due to sanitation. If such an argument were true in respect to this particular disease, why should the rule not be equally applicable to scarlatina, measles and whooping cough. Perhaps no two diseases are more contagious than measles and smallpox. But what are the actual conditions as learned from the reports of the Registrar-General of England, we find that during the same period that in smallpox, the mortality has declined 72 per cent.; that of measles has fallen only 9 per cent., and during the same period, notwithstanding the great strides made in sanitary improvements of all kinds whereby the masses and the classes of England have benefitted the death rate from all causes has only fallen 9 per cent.

Again the reader is reminded that the death rate in smallpox has been limited to persons below 15 years of age, the age group in which scarlatina, measles and whooping cough are most prevalent; while the mortality of children, of this same age group, does not differ very materially from what it was one hundred years ago.

Perhaps one of the strongest replies to this argument of sanitation occurs in the report of the German Vaccination Commission, 1884. "The remarkable and persistent decline (of smallpox) in Prussia since 1875 can only be due to the vaccination laws of 1874, because all other con-occurs in the report of the German Vaccination Commission, 1884. "The only difference is that in Prussia the revaccination of all school children at the age of 12 years was made compulsory in 1874."

*Inoculation.*

To complete the history of the disease a slight divergence must be made to refer to the introduction into Europe of a practice which had prevailed for some time in portions of the Orient known as "inoculation," which consisted in the careful inoculation, either by means of an inoculation needle or lancet or the abrasion of the skin by means of blisters, and the subsequent impregnation of the raw surface with smallpox virus. The object sought for and obtained was the protection of these persons so inoculated with smallpox against an attack of the disease, which in those days was generally of a severe type.

Owing to the fact that the inoculated smallpox possessed the infectivity and, therefore, a certain degree of danger, this practice, although possessing some points to commend itself, yet because of the dangers attendant upon the procedure, has been altogether discarded as a recognized medical procedure. The lessons, however, derived from its temporary adoption have been to strengthen the recognized theory of immunity and to confirm the practice of vaccination by calf lymph.

*First Use of Vaccine Obtained from Cowpox by Jenner.*

In the year 1796, Edward Jenner, an English physician, first inoculated an eight-year-old boy with vaccinia obtained from a case of cowpox in another human subject, and as a result the boy developed a typical attack of cowpox, and upon being subsequently inoculated with variola the results were negative, thus proving that in one case human-

ized vaccine lymph possessed the same immunizing power against smallpox as did the natural virus. The two succeeding years were spent by Jenner in similar experiments, and so convinced was he of the scientific truth, that in 1798 he published a modest brochure on the subject.

The first to experiment with the discovery were Dr. George Pearson, physician to St. George Hospital, and Dr. William Woodville, physician to the Smallpox Hospital, London. The reports of these two experimentors were adverse to the use of vaccine, but a careful enquiry and investigation made by Jenner showed the effects reported by these two early experimentors were due to a careless handling of the virus.

From the extent of the ravages of the disease the medical profession and the public were prepared to experiment with and try anything which offered the least bit of protection against the disease, with the result that before long the merit of the discovery was almost universally admitted.

#### *Introduction of Vaccination into Europe and America.*

France sent Dr. Aubert to London, in 1800, as the representative of the National Institute School of Medicine, and in 1805 Napoleon ordered all his soldiers, who had not had smallpox, to be vaccinated.

In Spain, in the first year of the 19th century, Don Francesco Pignelem performed the first vaccination, and the Government supplied lymph to the colonies by arm to arm vaccination of children on board ships.

In Italy, Dr. Louis Sacco, of Milan, was made director of vaccination in 1801, and in a few years had performed over 20,000 vaccinations.

Through the personal efforts of Dr. De Cairo, of Vienna, vaccination was employed in Austria in 1799, and such was the gratitude of the inhabitants of Brunn they erected a building to the memory of Jenner and annually held a festival upon his birthday.

The most marked early recognition received by this treatment, was from the Royal House of Prussia, to whom Jenner personally sent virus which was used first upon Princess Louisa, and the king was so pleased with the results, he founded a Royal Inoculation Institute in Berlin, the practice spreading rapidly to the various kingdoms and duchies. Bavaria, in 1807, made vaccination compulsory, being the first to adopt the beneficent law.

From Vienna the practice was carried to Switzerland and Russia, by students of De Cairo. In the latter country the emperor became personally interested from the fact it would save his people much suffering and bereavement.

In 1801 Jenner sent vaccine to Dr. Marcet, of Copenhagen, and here, too, the ruling monarch became interested, and a commission was adopted to investigate and report, the result being the enacting of legislation which stamped out smallpox in Denmark for twenty years.

#### *First Demonstration of Protection Afforded by Vaccination in America.*

The first medical man to practice vaccination in America was Dr. Benjamin Waterhouse, of Boston, the first Professor of Medicine in Harvard, who experimented first on members of his own family, and,



as might be expected from this modern hotbed of fads and fallacious doctrines, many malicious statements and facts were advanced, by reason of the many medical men who visited the doctor's house to study the cases, and possibly as a result of this, we find some two months subsequent to vaccination Dr. Waterhouse's children were sent to the hospital and freely exposed to the infection of smallpox, where, it is needless to say, they were absolutely immune. Waterhouse is said to have exclaimed, "One fact in such cases is worth a thousand arguments." It was not long after this that the doctor forwarded to President Jefferson, at Washington, some virus, and preferred the request that it be given into the hands of some careful medical practitioner. After some delay, the president, on August 6th, 1801, had Dr. Wardlaw, of Monticello, vaccinate some of the members of his own family, and in this manner was begun the good work in the United States.

In view of the sad havoc smallpox had been making in the world up to this time, and with such an auspicious beginning and such successful results, can it be wondered that the custom came rapidly into general use. With the scars and disfigurements of a disease from whose attack none were safe except such as bore upon them its impress, is it at all surprising the people who had met such a fatal enemy should hail with delight this new benefactor.

#### *Vaccine.*

As the reader may not understand the nature or origin of the vaccine used at the present day, a few particulars regarding it may not be out of place in this article. The reputable producers of vaccine (in the United States, from which country we derive our chief source of supply) are under the inspection of the Federal authorities and are licensed by that authority. The laboratories and stables are kept as clean and aseptic as possible, the inoculating of the calves and subsequent collection of the lymph and vesicle pulp, is surrounded with all the aseptic precautions practiced in modern surgery. The young calves themselves are carefully examined before being inoculated, and after the collection of the lymph, as pulp on the fifth day, the carcasses are examined by a veterinary surgeon, and if any indications of disease are found, the product of that particular calf is destroyed.

Two kinds of vaccine are used at the present time, the dry points and the glycerinated lymph put up in capillary tubes, the latter being most in favor amongst the best observers. It is this latter form which has the approval of the British Royal Vaccination Commission, and the form used in vaccinating the subject as shown in the illustration of a successful vaccination appearing in this article.

As an indication of the change of opinion in the Province of Quebec regarding the importance of vaccination as a prophylactic of smallpox, the Provincial Government has two vaccine farms, one at Montreal, the other at Quebec, both of which receive Government assistance, and are subject to Government supervision. The one in the environs of Montreal I found to be well conducted and carefully operated.

#### *General Rules Given for Vaccination.*

The following dicta may be set down in reference to vaccine virus:—

The employment of vaccine virus free from contamination is necessary for the proper performance of vaccination.

The vaccine should be obtained from fully developed and typical vaccine pocks when in the vesicular stage, and only when the contents are clear and free from pus organisms.

The use of the contents of vesicles becoming purulent, or of the dried scabs or crusts, is inadmissible, owing largely to the danger of mixed infection.

Only animal vaccine virus obtained from calves or young heifers, should be used.

And only the product of those manufacturers whose premises and process are subject to Government control, inspection and supervision, should be authorized for general use.

The Rules regarding vaccination itself, may be stated as follows:—

Vaccination should be performed within the first year of life.

The only contra-indications for its performance at this time are permanent and severe illness throughout the first twelve months of life.

The most suitable period within the first year is that before dentition begins, viz., probably from the fourth to sixth month.

If smallpox appears in the neighborhood, vaccination should be imperative upon all unvaccinated infants without exception.

#### *The Technique and Hygiene of Vaccination.*

While the operation of vaccination is a simple one, yet precision and care must be exercised in regard to it.

The usual site of operation is the outside of the arm, just below the shoulder.

The person and underclothing of the one to be vaccinated should be clean; preferably the vaccinator should have a bath just before.

The site of the vaccination should be carefully cleaned with soap and hot water, alcohol applied by means of absorbent cotton, and the parts subsequently washed with sterile water.

The stronger disinfectants should be carefully avoided.

The children of poor persons should by preference be vaccinated at public stations.

The skin should be shaded by either a carefully sterilized vaccine lancet or needle, for an area of a third to half an inch—the drawing of blood is to be avoided, hence deep scarification is not necessary.

In case two or more scarifications are made, the same should be made so as to allow from three-quarters to an inch of healthy skin between each.

The lymph should be allowed to dry upon the part, a process which takes from 10 to 30 minutes.

After drying the parts may be protected by a layer of carefully applied sterile cotton for at least 24 hours; and further, subsequent rubbing of the undershirt or sheet by means of a piece of clean linen sewn in place in that portion of the garment which would naturally come in contact with the part.

The patient should be cautioned against rubbing or scratching or otherwise interfering with the part.

#### *The Normal Course of Primary Vaccination.*

By the above expression is meant a description of the actual conditions following "a Vaccination." See illustrations from first to twelfth day.



In the majority of cases there is a lapse of three days during which nothing abnormal is noticed at the site of the Vaccination, the temporary inflammatory reaction at the site disappearing in about 36 hours after the operation.

At the end of the third, or beginning of the fourth, day, flat elevated red papules appear along the lines of scarification; on the fifth day vesicles appear thereon, extending to the outer edge of the scarification, and on the sixth day when they are filled with clear lymph and are pearly white in appearance, completing development on the seventh day. Accompanying this change at the site of the scarification, the areola carried by the congestion becomes broader and in time is surrounded by a second congested area milder in character and paler in color. Upon the eighth day the vesicles lose their pearly appearance, owing to the gradual formation of pus, and it is usual at this time for constitutional conditions to manifest themselves, as slight fever, headache; in children, restlessness, loss of appetite and peevishness; about the tenth day these symptoms disappear, and there is at the same time a subsidence of the local inflammatory conditions, the pock gradually dries up, a scab forming, which drops off in the course of the next two weeks, leaving a scar rosy in appearance and corresponding in size with the pustule; this scar ultimately becomes whiter than the surrounding skin.

#### *Revaccination.*

Experience teaches that the immunity afforded by a primary vaccination against smallpox, gradually diminishes with advancing years, and in many cases becomes extinguished altogether. A second vaccination has been resorted to as affording a continued immunity against smallpox. As the protection afforded by a primary vaccination differs in each individual, it is difficult to lay down any rule that will serve as a typical description of the course of the resulting scar; suffice it to say that the more typical the results, the more indicative are they of the lessened immunity against smallpox conferred by the primary vaccination.

In regard to the age at which revaccination should be performed, the statement of the German law will best indicate the consensus of authorities upon the subject. Every child must be vaccinated before the completion of the first year of life, except it has had smallpox, or physical disability prevents. Every pupil of a public or a private school must be vaccinated, (revaccinated) between the 13th and 14th years of life, unless it has had smallpox, or has been successfully revaccinated before reaching this age.

#### *Complications and Dangers Attendant on Vaccination.*

Regarding the dangers of vaccination it is found that most of the cases reported by the laity as due to vaccination will not stand the test of a careful and intelligent investigation. Deaths have, from time to time, occurred as the result of vaccination, but neither the deaths nor the complications are as many or as serious as the general reader is led to believe, as the following review of this portion of the question will show. Before doing so, however, the reader should be impressed with the fact that probably fifty million human lives have been preserved through the influence of vaccination during the last century. It must

PLATE I.

A SUCCESSFUL VACCINATION.



First Day.



Second Day.

PLATE II.

A SUCCESSFUL VACCINATION.



Third Day.



Fifth Day.



also be remembered that the mere prick of a pin or needle or inhalation of chloroform are often attended with fatal results—indeed, many of the minor accidents incident to modern life are followed or attended with suffering, and often result fatally, without ever the opponents of vaccination raising a word of complaint or protest.

\*The figures in the hotbed of prejudice, in England, are as follows: During the years 1881 to 1889 the average number of certified deaths connected with vaccination was 53, or an average death-rate of one to every 14,159 primary vaccinations, while the deaths from chloroform inhalation were one in every 2,000 anæsthesias, and for ether, one in every 20,000.

The German figures indicate that vaccination is more free from serious results than in England. †Voight states, that within the last five years he had vaccinated 100,000 people with but one death, and he stated the ratio of deaths to have been one to every 65,000 vaccinations.

The discussion of this question with the laity is most difficult, as naturally their grasp of medical theory and practice is, at the best, but hazy, and they cannot be expected to grasp the true inwardness of cause and effect. Those complications to which death is ascribed as the direct result of vaccination will be mentioned.

(a) Septicæmia and Pyæmia (blood poisons). This is a rare result of vaccinations. It was, however, much more frequent in the days when humanized vaccine was employed. Deaths reported as following the use of glycerinated bovine vaccine must be looked upon as due to secondary infection.

(b) Erysipelas, which is an acute infectious disease due to a specific germ which generally gains entrance to the body through a wound, hence it is not to be wondered at that with bad personal hygiene and unsanitary environment, there would be an increased liability to this disease. This trouble, too, like the former, was common during the period of the employment of human vaccine; the reported deaths from this cause in Germany, as reported in 1877,<sup>+</sup> were only two in 1,252,534 vaccinations.\*

(c) Tetanus, or lockjaw, is, so far as the writer is aware, unknown in Continental countries, while the minority (or antis) of the British Royal Vaccination Commission in 1896, after careful, almost microscopic examination, could only find one instance where this disease could be by them considered as complicating vaccination. After a careful study of 52 cases reported as coming under this heading, Dr. R. N. Nelson came to the conclusion that while the tetanus infection gained entrance at the site of vaccination, it was not introduced with the vaccine virus, but at some period subsequent thereto. If, as has been suggested, the tetanus germ could be derived from hay or manure, and thus find its way in the bovine virus, there would naturally be found a larger number of cases, due to the infection of the serum when taken from the calf, which is ultimately made into 5,000 vaccinations, for infection of a particular tube in the laboratory is impossible, and the \*Director of the Hygienic Laboratory of the United States Public Health and Marine Hospital Service was unable to find the tetanus (lockjaw) germ in a large

\*Welch & Schamberg. (1905).

†History of Smallpox and Vaccination. (1901).

PLATE III.

A SUCCESSFUL VACCINATION.



Sixth Day.



Seventh Day.

PLATE IV.

A SUCCESSFUL VACCINATION.



Eighth Day.



Ninth Day.



number of glycerinated points and tubes purchased in the open market; and he states further that the tetanus germ cannot grow in glycerinated vaccine or on dry points. Here, too, we find reference to the subject by the British Commission, so frequently quoted:—"A female child of two months developed tetanus on the 23rd day after vaccination. It was found that the child was vaccinated from the arm of a female infant aged five months, and at the same time and with the same lymph six other children were vaccinated, and none of them developed tetanus (lock-jaw) or sore arms." The general conclusion is, that in most cases the tetanus infection is taken into the system subsequent to vaccination.

**Syphilis.** With the use of glycerinated calf lymph and the discarding of humanized lymph, this question can be eliminated from the list, as the bovine species is totally unsusceptible to syphilitic infection.

**Tuberculosis.** The remarks just made in reference to syphilis may be taken to apply almost equally to tuberculosis, for it is a well established fact that calves rarely have tuberculosis; indeed, this extremely rare condition is perfectly safe-guarded by the subsection of the calves to what is known as the tuberculin test before being vaccinated, and the post-mortem adds an additional safeguard, if such were necessary.

**Leprosy.** This, the last of the list, may be dismissed by stating the objections are covered in the remarks on tuberculosis.

The conclusions arrived at by Dr. Ernest Hart regarding the dangers from vaccination, after a careful investigation of the subject in conjunction with Dr. Barlow, for the Royal Commission on Vaccination, may be summed up as follows:—

"The danger from invaccinated disease is almost nil."

"In a fractional percentage of cases, grave complications arise, but in almost every instance they are due to inflammatory or septic affections, such as are common to wounds, and the conditions are found to depend on more extraneous circumstances, than on any inherent properties contained in the vaccine itself."

Children, after vaccination, are at all times liable to suffer from various harmless rashes, which may give rise to some distress. If, however, the child is healthy, its circumstances wholesome, the lymph carefully selected and properly used, and if reasonable care be exercised after vaccination there is no doubt the dangers of the operation are extremely small.

#### *Ontario Experience of Vaccination.*

In concluding this important part of the subject, I would sum up my experience of 16 years' work in Ontario, during which, either personally or through the aid of assistants, over 40,000 vaccinations have been performed, and performed often in the most unsatisfactory conditions, I have never seen a fatality follow vaccination; I have never seen a life in jeopardy by reason of the inoculation of vaccine, and I have yet to see the first case where illness of either a temporary or permanent character could be ascribed to bovine vaccine. Further, in those cases where any injury has followed the operation, it has always, in my experience, been due to contributory negligence allowing of a secondary infection, the greater part of which could have been prevented, had

those persons observed even the elementary principles of cleanliness, and in the majority of cases a simple abrasion of the skin minus the vaccination would have been followed by precisely similar conditions.

*Ontario Vaccination Law.*

Under the statutes of the province vaccination is compulsory.

"Every child born within the province shall, within three months after birth, be vaccinated either by a qualified medical practitioner or by the person appointed by the municipal council for that purpose."

Every child over the age of three months becoming a resident in the province is required to be vaccinated.

The certificate of vaccination cannot legally be given until the eighth day after vaccination has been performed.

PLATE V.

A SUCCESSFUL VACCINATION.



Tenth Day.



Twelfth Day.

If, in the opinion of a medical practitioner, a child is found unfit for vaccination, a certificate to that effect remains in force only two months. In any case the child must be presented every two months to permit of renewal of certificate, otherwise the child must be vaccinated.

Revaccination within seven years may be required when deemed necessary, from students in attendance at high school, collegiate institutes, colleges and universities.

Revaccination within seven years may, under certain conditions, be made compulsory in any particular municipality or throughout the province generally.

Authority is given to the councils of all municipalities to enforce the foregoing provisions of the Act, and upon them necessarily rests the responsibility. If, therefore, lives are lost by reason of smallpox,



or personal and municipal losses of a financial character happen, through failure to follow out the wise provisions of the Act, the blame and loss rests with those failing to comply therewith.

If municipal authorities fail to comply with the provisions just referred to, the people of this province will have cause to regret their stupid indifference, for assuredly smallpox will visit us again in all its old time severity, and finding us in a similar position to that in which the inhabitants of Montreal were in; we will have to pay the penalty in like manner to that city, both in family bereavement and in financial loss, in which case the residents of this province will curse their own stupidity in listening to the seductive words of false teachers—and many parents will pronounce their anathemas when all too late to save the lives of their loved ones, against the present agitators who launch from time to time their squibs and skyrockets amidst an oratorical display as fanciful and lasting as the grandest display of fireworks one could wish to see.

### *The Anti-Vaccination Movement.*

The discovery of vaccination, like other epoch-making events of a scientific character, has met with opposition, abuse and ridicule, chiefly from English-speaking people, and described by writers of authority as metaphysicians, religious fanatics and faddists, persons who from time to time imbibe distorted, pernicious and intoxicating ideas of a few misguided scientists, who, seized with their own infallibility, often glibly discuss and dogmatize upon questions about which they possess little, if any, practical knowledge, scientists who often advance false statements and distort truths, facts and figures, all of which are eagerly swallowed by the faithful, notwithstanding the fact that their statements have been discarded by the highest sanitary authorities of the most cultured nations of the world as unworthy of consideration. The majority of the faithful, if they possess any scientific knowledge at all, would be of better service to the state if they applied it along their own particular calling in life, where possibly they may be considered authorities, and expected to dogmatize or pose as critics, but who, certainly, are a pernicious element in the community and ill-fitted to be the guide of public opinion in matters that appertain to preventative medicine. As the result of the action of these misguided opponents of the doctrine of the efficiency of vaccination in successfully preventing the spread of smallpox, many of the present generation, like their ancestors of biblical history, have been pleased with the prophesying unto them of smooth things, and knowing themselves still less than their false prophets, have unwittingly accepted their teachings. To such we commend the facts presented in this pamphlet.

The same or similar arguments were used against vaccination as were advanced against Franklin's discovery regarding electricity, by over-pious religious fanatics, who regarded both lightning and smallpox as God's punishment for sin. It is to be noted, however, that but few clergymen have brought forward the religious objection, the objectors have been those in the narrowest circles of the excessively pious laymen.

Perhaps the most persistent objectors have been those of a politico-legal character, raised in connection with compulsory vaccination, the line of argument being directed particularly at the principle of "compulsion," as being contrary to the free-will and liberty of the individual,

the argument being that vaccination and revaccination are matters that concern the individual and not the state, and in this manner a number of susceptible individuals are influenced and led to believe that they are the only guardians of liberty. It must be pointed out that the arguments on these lines are based on false conceptions of liberty, for personal liberty and free-will have legal limits, and under no condition can they be permitted to come into collision with what is for the common weal.

The result to the communities where anti-vaccination has prevailed, has invariably been the loss of life, loss of time, loss of money, and the increase of suffering; in short a reverting to those conditions which prevailed, not only on this continent, but throughout the civilized world, previous to the adoption of vaccination.

As the bulk of the statement, facts and figures contained in this article are given to educate the reader in all that appertains to the question, and the instances given are but examples of hundreds, nay thousands, of similar if not stronger convincing facts, all of which go to prove the unbounded benefits to be derived from the practice of Jenner's gift to his fellow-men, no further reference will be made to the opponents of the practice. I will, however, submit the opinions of four leading authorities upon the question, one of whom practises in Basle, Switzerland, the other two have been workers in the special sphere of medicine for many years in the United States, and the fourth is the eminent and worthy successor of the immortal Pasteur.

#### *Dr. Immerman's Resumé.*

Dr. Immerman, of Basle, in a monograph on vaccination in Nothnagel's "Encyclopedia of Medicine," in a series of masterly arguments, completely vindicates vaccination as a preventative of smallpox. In his "Closing Remarks" occur the following as his *resumé* of the question.

Up to Jenner's time, variola was the most common and deadly of epidemic diseases.

Vaccination was the first means that produced a change in a prophylactic respect, and it fulfils the claims of a perfect prophylactic against smallpox.

It is easily performed and its practice is dangerous to no one.

It lends to the vaccinated, when it takes, an almost sure temporary protection against smallpox.

Actual injuries to health in general are not to be apprehended.

The doctrine of degenerating influence in the race is simply false.

The diminution in the morbidity and mortality of smallpox in the nineteenth century is the result of vaccination and nothing else.

The natural contagiousness and malignancy of smallpox have not grown less, for the non-vaccinated are attacked when the opportunity occurs, as in former times.

If the non-vaccinated suffer less from the disease at the present day it is because the opportunities are less common, epidemics being less frequent and extensive as a result of vaccination.

The beneficial influences of one vaccinated (done in infancy), is evident in that the relative morbidity and relative mortality for the vaccinated in a mixed population during an epidemic of smallpox, is less than for the non-vaccinated.



Revaccination and its periodic repetition renew the complete temporary immunity.

Scruples on the part of the state against compulsory vaccination are weak, since vaccination is useful to the individual and indirectly protects the community.

Compulsory vaccination of children is not only a desideratum, but an ethical duty, since children, as yet without the power of deciding for themselves, should not be given over arbitrarily to their elders, and thereby eventually become the prey of smallpox.

The opposition to compulsory vaccination demonstrates that the opponents do not possess a mature understanding of one of the most important questions in hygiene.

In the conscious security of the body against the threatening assault of infection, lies not only one of the principal problems of hygiene, but an actual problem of human culture.

*Summary by Drs. Welch and Schamberg.*

Referring to the value of vaccination, Welch & Schamberg, of Philadelphia, in writing upon the subject of smallpox, state, "We know of no eminent physician who is not convinced of the efficacy of vaccination. Those physicians who have had a large practical experience with smallpox are the most ardent advocates of vaccination, for they have had the best opportunity of noting the behaviour of vaccinated individuals in the presence of smallpox. The few physicians who are found in the ranks of the anti-vaccinationists are usually men without practical experience in smallpox; they argue with statistics (often wittingly or unwittingly distorted) and not with facts derived from personal observation. These persons have in various countries banded themselves together to antagonize the practice of vaccination and to oppose compulsory enforcement."

"We prefer to look upon these persons as *misguided*, rather than regard them in a less charitable light," and these authorities conclude as follows: "Anti-vaccination propaganda have caused many innocent victims to be consigned by smallpox to a premature grave," and in this, as in their preceding statements, the writer, after sixteen years of practical experience with the disease, fully and heartily concurs.

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*Latest Words of Prof. Metchnikoff.*

Prof. Elie Metchnikoff, Director of the Pasteur Institute, Paris, and successor to its great founder—in his recent work on "Immunity in Infective Diseases," (1905). Speaking of Protective vaccination, thus expresses himself, and referring to Germany.

"Compulsory vaccination was introduced there more than a quarter of a century ago (1874) and statistical information has been collected with great care. With the exception of a slight increase during the period from 1879 to 1885, smallpox has diminished progressively since the proclamation of the new law, and has become so rare that in 1897 there were only 5 fatal cases in the whole German Empire. In the space of 13 years (1886-1898), in a population which embraces two-fifths of the total inhabitants of the German Empire, there were altogether five

fatal cases of smallpox occurring in persons who had been successfully revaccinated. Moreover, the majority of the cases of smallpox occurred in the maritime towns or in the vicinity of the frontier of the Russian Empire. Specially favorable results have been obtained in the German army, in which, even before the law of 1874, vaccination was compulsory. In twenty-five years there occurred in the Prussian army only two cases of deaths from smallpox. In summing up the statistical data on vaccination Kübler from whom we have borrowed the above statements, expresses himself as follows: "The history of smallpox must in all cases register the fact that this dreaded disease has, as the result of general vaccination, not only become rare in the German Empire, but it has almost completely disappeared." The example of Germany encouraged several other countries to introduce compulsory vaccination, and Roumania, Hungary, and Italy have in turn promulgated similar laws. Here also it was not long before satisfactory results were obtained. In Italy especially the mortality from smallpox has largely decreased in recent years. . . . \*In France a law is being framed which will render infant vaccination compulsory. Up to the present this has not been the case, and smallpox from time to time causes considerable ravages, as we may see at this moment in Paris. During recent years the mortality from smallpox in France has been from 90 to 100 times greater than in Germany. It is greater amongst the female population than amongst the males; this constitutes a fresh argument in favor of vaccination. Although not compulsory for the whole of the French population, it is so for soldiers and for children who carry on their studies in schools, and it is for this reason that smallpox is rarer amongst males. The most complete demonstration of this is found in the incidence of smallpox in the French Army.

In spite of a less numerous contingent of troops, (451,941-457,677), the mortality from smallpox was greater during the period when vaccination was not yet carried out generally (1885-1887), than during the period 1889-1896, when it was vigorously enforced on a much larger number of soldiers, (524,733-564,643). From 13.6 fatal cases per year in the first period the annual figure fell to 6.

It follows, when we take into consideration the whole of the very numerous data at our disposal, that the usefulness of vaccination, followed by revaccination after some (5-7) years, cannot be seriously called in question.

#### *Personal Experiences.*

The experience of the Medical Health Officer of the City of Ottawa, as regards the outbreak of smallpox which occurred in that city in 1902, is, as given by Dr. Robert Law, "343 cases occurred in 269 houses; of these 343 only 29 showed a vaccination scar, all of many years' standing. Four (of these) claimed to have been revaccinated two years before, but showed a very faint scar." As to the effects of vaccination, this officer states, "the carrying out of a general order for vaccination soon showed its effects in the decline of the epidemic, not one person who complied with the law developing smallpox." Of the many thousands of vaccinations performed at that time, Dr. Law states there were no serious results reported.

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\*This law has recently been passed, making both vaccination and revaccination compulsory.



As previously stated, during sixteen years many opportunities have presented themselves to study the question in all portions of the province in outbreaks attended with deaths rivaling any of the serious epidemics of history, as well as in others in which the mortality has been as low as any on record. The immunity to the writer has come from a primary infantile vaccination, a revaccination before the twelfth year of life, both with humanized lymph, and from subsequent revaccination—and to this fact alone is due the immunity he possesses.

During this time nearly 5,000 cases have been examined, and several hundred treated personally by the writer, and in not a single instance has the disease been seen in a person presenting a typical vaccination scar, the result of a primary vaccination within seven years of the attack of smallpox; and no instance has presented itself where the patient had ever been revaccinated—while on the other hand, in hundreds of families, the immunizing effects of vaccination have been exemplified, in perfectly protecting those vaccinated, against smallpox.

During these sixteen years I have only met with one example of a person being apparently a natural immune. Again, I have repeatedly seen the vaccinated father and mother nurse a family of unvaccinated children through weeks of smallpox, without themselves contracting the disease, even in a modified form, although that one vaccination had been made in the case of many parents more than forty years before.

In the schools of the province several instances have occurred where the pupils of a form have all been exposed for days to the infection of smallpox, and the disease has attacked only the unvaccinated scholars.

During the epidemic which prevailed some five years ago in New Ontario, chiefly amongst the shantymen, a staff of fifteen officials were exposed daily for more than two months to smallpox, but in no single instance did any of these officials, all of whom were revaccinated before engaging in the work, contract smallpox.

In one camp, which had to be quarantined owing to a case of smallpox having occurred therein, all the employees (46 in number) but one, were immediately vaccinated, the one who refused, stating he was prepared to swear he had been vaccinated, and also had suffered from smallpox, although no evidence of either could be found. Under these conditions he was allowed to pass unvaccinated. The forty-five proved immune to the disease, while the one ignorant and conscientious (?), but unscrupulous objector developed smallpox, and within the three weeks of my visit died a horrible death, an object lesson to all of the same ilk.

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## Notes on the Illustrations.

### *Smallpox.*

The three illustrations are from photographs very kindly furnished by Dr. Jay F. Schamberg, Philadelphia, U.S.A., the joint author with Prof. Welch of the Work, "Acute Contagious Diseases," from which the illustrations are taken.

The pictures are so striking and show the effects of a primary vaccination in preventing smallpox in two instances and in modifying in the third that no comment thereon is necessary.

*Vaccination.*

The ten illustrations are from photographs taken by Park Bros., Toronto. The patient, an infant, was vaccinated on April 7th, 1906, by Dr. Rowena G. D. Hulme, with glycerinated vaccine manufactured by Mulford. The first photo was taken immediately after vaccination, the others in each of the succeeding days with the exception of the 4th and 11th days which were Sundays. In every respect the progress of vaccination is normal and the illustrations may be taken as accurately showing what happens in the case of a normal vaccination.

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